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ABSTRACT

The development of a news delivery system capable of implementation with current technologies and usable on most cable television systems is described. The choice of digital frame grabbing and high speed digital transmission is justified. Then the choice of hardware for home terminals and transmission equipment is explained. It is claimed that systems of this kind could become significant alternatives to conventional newspapers and could make it possible for new organizations to enter the newspaper business without large capital investment. (Author/PF)

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*Information delivery on cable systems began more than ten years ago by placing a camera in front of newswire teletype machine. Cable subscribers could tune to one of the cable TV channels and see the teletype machine printing out news and weather information in just the same way that news editors in radio and TV newsrooms were watching the news being printed out in their newsrooms. At the same time similar cameras were mechanically scanning time clocks and weather display dials to provide this information on a cable television channel. The development of electronic character generators allowed the newswire lines to be transferred directly to electronic television format and these systems were gradually refined and improved. As these services grew more popular the news services took the trouble to re-write and re-edit their services specifically for this delivery medium. The service in its present form is an alpha-numeric character generator system operated at TTY speeds, or slightly faster and displayed on TV screens at a speed judged slow enough to suit the lowest common denominator of reading speed in the subscribing public. Most systems make no special charge for this service, the cable system usually absorbing the charges made by the wire services for supplying the copy. The material displayed, order of presentation and duration of display is controlled by the wire service and the subscriber can only tune in and take "pot luck". Some newer cable systems with surplus channel capacity have installed multi-channel character generator systems with computer controlled formatting and editing which allows the editing of newswire feeds into various categories for display on specialized channels, e.g. a "sports channel", "news channel", "weather channel". These augmented systems usually provide facilities for generation and display of information on a local basis to supplement the wire service feeds.*

*All of these improvements still leave the service as a rather rudimentary display of information. Channels are used rather wastefully and users still participate on a "pot luck" basis - only the number of "pots" has been increased.*

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## *THE IDEAL SYSTEM*

*At the other end of the information system technology spectrum we have seen demonstrations of interactive information retrieval systems in which the cable system acts as a communications medium between a computerized information bank and a computer*

terminal in the subscriber's home. Ideally the whole system would be capable of handling "pictures" as well as alpha-numeric information. These idealized systems require a bi-directional transmission capability in the cable system. Such capability is not generally available on Canadian cable television systems except on a strictly experimental basis nor have we seen many systems elsewhere in the world with a fully developed, practical two-way transmission capability.

PRACTICAL SYSTEMS

Our interests lay in the direction of developing practical information systems capable of implementation with current technologies and usable on most cable television systems. We therefore had available reasonably large amounts of spectrum since most cable systems have unused capacity.

Our first decision was that a cable information system would have to depend on "frame grabbing" and that such frame grabbing would have to be digital, limiting the system capability to alpha-numeric information and simple graphics. Video frame grabbing, particularly in full colour, was considered too expensive and too complicated to be used in practical home terminals at low cost for perhaps a decade. Digital frame grabbing could be executed with digital integrated circuit technology. Digital IC technology is low cost and is becoming increasingly cost-effective year by year. The phenominal technical and commercial success of pocket calculators and the long delay and expected high cost of video cassette and disc devices convinced us that digital technology was the route to follow at the present time.

We decided to simulate interactive operation by repetitively feeding information into the cable at very high speed. We also decided that digital transmission at rates of 2 MBit minimum would be required to build a usefull system. Our previous experience with conventional character generators for cable television indicated that a 256 character page of 8 lines of 32 characters each would be suitable as an initial format. This is a rather small number of characters compared with computer type CRT displays but this service is intended for display on home type television receivers in a home type environment. Tube masking is rather uncertain and unpredictable and the sharpness and resolution on many home receivers is marginal. The information displays would be viewed at regular "home distances" as a short term alternative to entertainment viewing.

We decided also to contain the basic service within the bandwidth of a standard television channel - 6 MHz. Modems would be developed with this constraint, i.e. the transmission must fit within a 6 MHz RF channel and be compatable with conventional television signal transmission on adjacent channels if necessary. We then decided that the first level of information would be provided with a 2 second repeating cycle time so that the average access time for a subscriber would be one second. A subscriber requesting a particular page number might get it immediately if that page happened to be "passing by" or he might wait as long as two seconds if the subscriber "just missed it". The average time would be about one second. Provision has been made for handling full upper and lower case alphabetic characters and the usual complement of numerics and special characters. An 8 bit ASCII code has been selected for initial work. A full 256 character page requires about 2,000 bits and a 2 MBit data rate is capable of transmitting about 1,000 such pages per second. A 2 second cycle time means that the full information magazine will be about 2,000 pages.

The "magazine" size can be increased by developing hierarchies of information on longer cycle times interleaved with the shorter cycle time information. Types and items of information judged less popular would be interleaved with cycle times of 4, 8, 16 or more seconds. Subscribers requesting these less popular categories or items would have to wait longer average times for the requested frame to appear. We estimate that the usefull "magazine" size can be increased to about 10,000 frames in this way.

Magazine size is also limited by the data transmission rate. Our initial design is based on simple AM NRZ modulation. We are studying more complex modem technologies that would push our data rate up toward 6 MBit/second. This transmission rate is limited by the economics of the data demodulator that has to be provided in each home terminal and the economics of the refresh memory and data buffer for each home terminal.

The home terminal which we have designed has a simple numeric keyboard on which the subscriber keys the page number desired. It is proposed that the information system be designed around a system of index pages which guide the subscriber to the desired level through three levels of indexing. The terminal grabs the desired digital frame from the system as it becomes available and stores it internally. A complete character generator system within the home terminal provides a colour alpha-numeric display for the home receiver. Initial design integrates the terminal with a conventional set-top converter for tuning function.

Present design uses shift register memory within the home terminal. Present technologies seem to limit us to the 2,000 bit storage requirement of one page as economical for consumer terminals. This means that the subscriber grabs and reads one page at a time. When the subscriber finishes a page he keys a "next page" key which automatically increments the page counter to await the next page. We are watching the development of CCD type shift registers which will give us up to 1,000 characters in local storage at very attractive prices. This is equivalent to four pages and will allow a whole "story" or at least four pages of it to be grabbed at one time for local storage and display. Display of "next page" up to the full four page local memory would be instantaneous. Use of these larger local memories would allow us to increase the size of the magazine since cycle times could be lengthened. A subscriber getting four pages at a time would be more tolerant of a longer waiting time between "stories".

We are considering modem techniques that would allow low cost construction for very high speed data transmission (up to 6 MBS). We hope that techniques can be developed that will use available, low cost IC's which have been developed for colour television receiver chroma demodulation. Chroma demodulation involves "clock recovery" and a demodulation of complex phase and amplitude modulation. It should be possible to design a data format and transmission system that would be compatable with NTSC colour transmission principles. This would allow use of low cost colour television receiver devices and possibly allow future integration into home television receivers. We are also considering compatability with other sources of digital data, e.g. cassette systems or even telephone terminals.

Conversely we are also considering whether use of existing home television receivers for information display is really optimum. A large part of the terminal cost is involved in converting data to TV compatable video, a very complex operation. The usual viewer - TV set distance for viewing entertainment programs may not be optimum for alpha-numeric display and may force considerable display inefficiency. Since colour is not absolutely essential for our purposes we may be tying up very high cost television receivers for very simple display purposes. The use of the home receiver as a data terminal may indeed be a false economy. An alternative low cost, small screen CRT display or an alternative panel display of some kind may be more usefull and may result in a lower cost overall system.

*SOFTWARE*

*We have been designing a generalized alpha-numeric information system. Our particular economic interests are in the consumer market, i.e. home subscribers paying out of "after tax" income rather than commercial subscribers paying for a "tax deductable" service. Our initial studies have indicated that "hard news" is the likeliest application for systems of this kind although the system can, of course, be used for other purposes. For hard news delivery we expect that the system would be operated in co-operation with a local newspaper or other undertaking that already has an active news gathering and editing facility. News for cable delivery would be re-edited and reformatted for this particular medium with the help of a "head-end" computer that would also handle the repetitive data transmission.*

*POLICY CONSIDERATIONS*

*"Soft" news delivery systems of this kind have considerable appeal in a "conserving economy". Systems of this kind have the capacity to become significant competitors or alternatives to conventional newspapers with considerable saving in the use of newsprint. They would probably not completely supplant hard copy newspapers but they could make significant inroads into their circulation.*

*Systems of this kind also make it possible for new organizations to enter the "newspaper" business without the very large capital investment requirement for large presses and distribution systems. We are not sure whether such a system would be completely supported by user subscription or whether there would be some advertising function to help support it. One of the most important questions to be answered in pilot trials of systems of this kind is whether the public, in significant numbers, will pay directly and completely for information and services which they have been accustomed to receiving "free" or on a heavily subsidized basis. Similar problems confront PAY-TV system enterpreneurs.*

*Systems of this kind, requiring very high speed data rates to simulate interactive operation, necessarily require wide bandwidths which can only be provided at this time on broadcast TV channels or cable TV channels dedicated to this purpose. Even cable TV channels are limited in number and there may have to be some regulatory policy which controls access to the limited number of channels available for such purposes. Telephone based systems such as BPO's newly developed system will severely strain existing lines and facilities if used on any scale unless higher speed transmission at low cost is achieved. Completely unregulated and free development of such information systems may have to await a new generation of communications systems which will have virtually unlimited capacity.*